

# Inflation and Demand for Money in Emerging Economies: Evidences From Nigeria

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## Abstract

The economic performance of the Nigerian economy revealed that for quite some time now, the GDP of the country has been declining and fluctuating over time as compared with the U.S economy that was growing even in the face of inflation. The focus of the research was therefore a critical evaluation of factors that can encourage increasing and stable growth even in the face of inflation backed with high rate of money demand. The study examined the effect different economic variables such as inflation, income; interest rates, price level and exchange rate have on demand for money, by applying regression analysis with an Error Correction Model (ECM) on various economic variables, covering a period of thirty-three years (1970-2003). The study revealed on one hand that inflation was not affected by trend but by Nigerian government policies and that inflation does not exert any significant influence on demand for money. It is therefore recommended that the authorities of should implement policies that will ensure minimal inflation rate. Also, attempt to control the amount of money people hold should not be done through inflation since it would not be effective but should be controlled by the adoption of an appropriate income policy

**Keywords:** Emerging economies, Inflation, Money, Nigerian economy, Structural Adjustment Programme

## 1.0 INTRODUCTION

Inflation has been observed to be a regular occurrence in the economy of many countries. The economy of the United State continues to grow and prosper in the face of inflation (Baumohl Bernard) relative to the Nigerian economy. Though both countries are faced with the same inflationary condition but the rate of growth and prosperity in the U.S is incomparable with Nigeria's rate of prosperity and growth. Evidences from the inflationary trends of the two countries shows that U.S had an average inflation rate of 2.7% in the 1960s, 7.1% in the 1970s, and 4.9% in the 1980s, 2 - 3% in the 1990s, in contrast to Nigeria's double-digit inflation rate. Starting from the 1970s, Nigeria had an average inflation rate of 15.03%, 20.16% in the 1980s and 30.65% in the 1990s (Central Bank of Nigeria (CBN) Statistical Bulletin 1994, Nigeria Development Report, 2001). During a period of inflation, in any country, people desire to hold more money in order to meet their transactions without corresponding increase in production. This is because the value of money has been reduced. The reduction in the value of money has an impact on investment because production will be greatly affected. As a result of this effect on productivity, the economic growth of such a country will be affected.

In spite of the above observation, the U.S economy is still able to manage its inflation and demand for money effectively to bring about growth. Also, considering the inflationary statistics in both countries, inflation is mild in the U.S while inflation is severe in Nigeria. Despite the inflationary situation faced in the U.S economy, their economy continues to grow and prosper unabated (Baumohl). Though the Nigerian economy is also growing, the level of growth cannot be compared in anyway. Considering the rate of growth in the Nigerian economy, starting from 1990, the Nigerian economy had a growth rate of 19.7%. This increased to 27.95% in 1991, 58.6% in 1992. The rate however dropped by 27.5% in 1993, this further dropped by 5.13% in 1994. In 1995, however, it rose again by 27.34%. Then in 1996, the rate dropped again by 25.9% followed by another decrease of 24.4% in 1997 which further reduced by 5% in 1998. The growth rate rose again by 16.9% in 1999 and dropped by 6.1% in 2000. The trend shows that the growth rate of the real Gross Domestic Product (GDP) of the Nigerian economy has been declining and fluctuating over time.

As a result of these observations, there is need for a critical evaluation of the factors that can encourage increasing and stable growth rate even in the face of inflation backed up with high rate of money demand: it is against this backdrop that the research is being carried out. The study adds to the body of knowledge in that it attempts to improve on other studies because made use of a more recent data to discuss recent developments within the economy. Also, the methodology used was quite different from what past studies had adopted. Although, very many studies had been carried out on demand for money but there was no conclusive findings because: the data setting was changing so also the methodology.

## 2.0 LITERATURE REVIEW

### 2.1 Conceptual Clarification of Money and Inflation.

Money as a liquid asset does not yield any interest - income to the possessor like government bonds and corporate debentures. People hold money because it possesses some advantages which are absent in other assets.

These advantages are collectively called liquidity. Money is an essential ingredient in conducting most of the economic transactions in the economy.

According to Umo (1986) demand for money refers to the willingness of people to hold money as cash balances. Such demand comes from the basic uses of money. Demand for money refers to people's desire to hold money in liquid cash. Keynes in his general theory used a new term "Liquidity preference" for the demand for money. Liquidity preference refers to the demand for money by people such as income earners, businessmen and wealth holders to carry out their domestic and business functions. Moser (1997) added that demand for money is commonly described in terms of its ability to facilitate transaction (medium of exchange) and store of wealth. Sriram (2001) affirms that demand for money plays a major role in macroeconomic analysis especially in selecting appropriate monetary policy actions. Boughrara (2001) views demand for money as the link between monetary policy and the rest of the economy. Money can be defined as anything which is acceptable by the people in the payment for the goods and services and the discharge of debts (Vaish 2000). Liquidity is the most important feature of money which differentiates it from other forms of assets whether financial assets like shares, bonds and stocks or real assets like land, house, car and machine.

Demand for money is derived from two important functions of money. They are as a medium of exchange and as a store of value. As a medium of exchange, individuals wish to hold money in liquid cash. As a store of value, individuals wish to hold money in the form of assets it may be financial assets like bonds, corporate debentures or real assets like houses, cars and hectares of land. As a medium of exchange, money has helped to relieve the society of the inconveniences of trade by barter. It has helped to remove the problem of double coincidence of wants associated with barter trade. The money economy enables people to deal with the separate problem of buying and selling at a time. The use of money is time and effort saving. Money reduces the number of transactions needed to achieve a given degree of specialization. It enables people to buy from one person at a place and time and sell at another place and time to another person. Money has made multilateral trade possible. As a store of value, money helps individual to guide against the eroding tendency of inflation. Money held in liquid cash can easily lose its value compared with money held in form of asset. A rise in the general price level will pay off for an individual that has his money stored up in asset form. Such an individual tends to gain more during an inflationary period.

Inflation is a worldwide phenomenon, the most serious in history being the hyperinflation of the Germany in the 1930's. Inflation can be defined as the persistent increase in the general price level of goods and services in a country. It is a steady rise in price resulting in diminishing purchasing power of a given nominal sum of money. Umo (1986) defines inflation as a generalised increase in the level of prices sustained over a long period in an economy. Afolabi (1991) views inflation as a sustained rise in the general level of prices. This view reveals that inflation is characterised by prevalence of increases in prices generally not just increases in the prices of one or few commodities and this increase must be sustained and not just a temporary fluctuation. Inflation was defined by the neo classical economists as a galloping rise in prices as a result of excessive increase in the quantity of money (Jhingan 1997). It can also be defined as a sustained rise in the general price level of goods and services. Inflation occurs when too much money is chasing too few goods and services. Inflation shows a state of disequilibrium between the aggregate supply and aggregate demand at the existing or current price resulting into a rise in the general price level in the economy.

Inflation leads to a general loss of confidence in the money and one of its worst evil is that it deprives money of its services as a store of value. Inflation, it is argued, is a monetary phenomenon. Therefore, this calls for a check, using appropriate monetary measures. Open Market Operation is an important instrument under the monetary policy at the disposal of the central bank for influencing the supply and cost of credit. This involves the buying and selling of securities in the open market. During inflation, government needs to increase its sales of securities such as bonds, treasury bills, and treasury certificate e.t.c to the public. This can make excess cash balance to be withdrawn from the public. The process involves selling securities in the open market. This process will help in the reduction of the purchasing power of people and reduction in the money circulating in the economy. Bank rate is also another monetary tool. Increasing bank rate increases the cost of funds thereby encouraging borrowing especially for speculative purpose. Bank rate however has to be used with caution. Hubbard (2000) opines that inflation can be regarded as a sustained rate of increase in the price level. Inflation has been characteristic of most economies since the Second World War. Inflation can be traced to sustained monetary expansion.

From all the views about inflation so far, most economists are of the view that inflation is not a sudden rise in price but a process of rising prices.

## **2.2 Approaches to demand for money**

The classical approach to demand for money can be best summarised in the native quantity theory of money which states that people hold money only for the purpose of buying and selling of goods and services in the economy. According to the classicists, money did not influence the actual processes of production and

distribution in the economy. Money as a medium of exchange only facilitated the exchange of goods and services in the economy. The Classicists believed that the demand for money mainly depends on the level of transactions which was determined by the level of aggregate income. The level of total income is the full employment income because in the classical analysis there was no obstacle to the attainment of such a level of income since supply always created its own demand (Arthur Pigou, 1917; Alfred Marshall, 1923; I.M Keynes and D.H Robertson).

The Keynesian approach to demand for money was quite different from the classicists. According to the Keynesians, money is an asset like any other asset to be held for its own sake and not just a temporary abode of purchasing power. They are of the view that money is not held for transactions purposes alone. The Keynesians believe that money as an asset has utility and could be demanded and held for its own sake because of the convenience, confidence and liquidity it gives. Keynes, in his own case added the speculative or asset demand for money to the transactions and precautionary demand for money. According to him, an individual's total demand for money in any situation is the result of a single decision which is made up of the transactions, precautionary and speculative motives for holding money. To Keynes, transactions demand for money stems from money's most important function as a medium of exchange in the economy. Keynes introduced the speculative demand for money to break away from the classical approach to demand for money which supports only transactions demand and precautionary demand for money.

The modern approach to demand for money otherwise known as monetarism is associated with the works of Friedman (1956). He in his reformulated version of the quantity theory made his first assertion that "the quantity theory is a theory of demand for money". It is not a theory of output or of money income or of the price level. The demand for money on the part of wealth holder is synonymous with that of the demand for consumption service. He regards the amount of real cash balances as a commodity which is demanded because it yields services to the person who holds it. Thus, money is an asset or capital good. Friedman, in his modern approach did not attempt to separate money demand into component or motives as Keynes had done. Instead he relied majorly on the determinants of asset demand or determinants of demand for money. The monetarists believe that demand for money is influenced by the level of income, interest rate or cost of holding money and individual tastes and preferences. This is however contrary to what the Keynesians believe. They believe that demand for money is influenced by three motives of transactionary, precautionary and speculative motive for holding money.

### **2.3 Empirical Studies from Developing Countries**

Celasun and Goswami (2002) attempted to answer the above mentioned questions by examining money demand and inflation in the Islamic Republic of Iran. They tested whether disinflation during 2000 - 2001 represents a structural break in the data. Using an error correction model for their estimation, their analysis first established that real money (M1) balances have a long run relationship with real output and a vector of opportunity cost variables proxied by the inflation rate and the rate of depreciation of the Iranian currency against the dollar in the parallel market. Though their study examined money demand and inflation, they laid more emphasis on the effect of demand for money on inflation and the structural break in data during 2000 - 2001.

Ventura (2000) model tested the influence of income, the inflation rate and the quantity of real money balances on demand for real money balance held during the previous period simultaneously. The model showed that a change in the inflation rate caused only a small decline in real money balances over the short term. It was discovered that a positive relationship that was not statistically significant exists between demand for money and income. It was also revealed that there exists a statistically significant and positive relationship between the demand for money and real money balances.

Slok (2002) investigated whether there was a significant money demand relationship in Mongolia. He made use of panel data covering 22 Mongolian regions over the period 1993 - 1999. It was discovered that despite a transitional economy as rudimentary as Mongolia, a stable money demand exists. Sloks analysis revealed an income elasticity of around 0.5 reflecting the larger role for transactions demand for money. The major shortcoming of his paper is that he laid more emphasis on transactions demand for money neglecting other motives of holding money. This paper will however focus more on this area of neglect.

Arlt, Guba, Radkovsky, Sojka and Stiller (2001) formulated the vector error correction model to examine the influence of selected factors on the demand for money. They attempted to show the developments in the demand for money in the Czech Republic between 1994 and 2000. Their results revealed that the real demand for money in the Czech Republic from 1994 - 2000 had developed mostly under the influence of traditional factors such as real GDP and nominal interest rate development.

Habibullah (1995) carried out an empirical evaluation of the factors affecting the demand for broad money M3 in Malaysia. He estimated a model which incorporated inflation as one of its variables. The study was based on Malaysia annual time series data for the period 1973 - 1987. The result suggested that demand for broad money M3 is determined by real income, the short term interest rate, own rate of money, the inflation rate

and the previous level of money holdings. Sriram (2001) surveyed a selected number of studies that evaluated the demand for money using the error correction model approach in the 1990s in several industrial and developing countries. In his findings, it was discovered that there was one co-integrating relationship among real money, real GDP, inflation and interest rate. Boughrara (2001) evaluated the long run determinants of demand for money in Tunisia during and after the reform. He proposed an error correction model as an alternative to partial adjustment model. The result of his findings showed that income, as measured by the gross domestic product and Treasury bill rate affect the long run money demand for Tunisia. His estimation revealed that the short run income elasticity of money demand is high

## **2.4 Empirical Studies from Nigeria.**

Adejube (1988) examined the extent to which real money balances are functions of income and interest rate among other determinants which determine demand for money. Using the Chow's test, he investigated the temporal stability of the demand for money function. Using the ordinary least square approach, he discovered that interest rate was a superior measure of opportunity cost of holding money. Also the demand for real money balances was found to be highly responsive to interest rate changes. The demand for real money balances in Nigeria was found to be income inelastic. He also found that inflation rate was not statistically significant. He concluded that demand for money function in Nigeria could be explained by such variables as incomes, interest rate and lagged money demand. Since Adejube's study was published in 1988, the time lag between 1988 and now is enough for inflation to have exerted a significant influence on demand for money. This is due to the fact that inflation has readily eaten deep into the fabrics of the country between 1988 and now. Our study attempted to shed more light on this aspect.

Akinlo and Folorunso (1999) re-estimated the money demand function in Nigeria using the error correction mechanism technique. They also tested the stability of real M1 (narrowly defined money) and M2 (broadly defined money) using the Chow's test. Using the co-integration and error correction modelling strategies, they examined the relationship between demand for money and their determinants. This they carried out through a series of reduction from over parameterized models, interrelating money demand, exchange rate, inflation rate, measured income, price, domestic and foreign interest rates and error correction term. Their study revealed that there exists a stable long run demand functions for real M1 and M2 balances as a function of real income and other explanatory variables. The authors were of the opinion that attempts to control the amount of money people hold through domestic interest rates ceilings will be ineffective because interest rate is not really significant. They suggested the adoption of an appropriate income policy to effectively control the amount of money people hold. Though they incorporated inflation rate into their model, they did not carry out a rigorous investigation on how inflation rate affects the amount of money people hold. This shall be the point of departure of the present study.

Nyong (2001) made use of quarterly data from 1980 - 1996 to challenge the conventional estimation of the money demand function that has been estimated particularly in the Nigerian context. He revisited inflation in Nigeria by taking advantage of longer time series data and various development under the Structural Adjustment Programme (SAP) particularly exchange rate depreciation. Using the past and current values of inflation in his analysis, he discovered that past values of inflation contribute significantly to the inflationary phenomenon experienced in Nigeria. Other factors such as productivity growth, monetary expansion, foreign exchange scarcity and imported inflation were also discovered to have contributed to the Nigerian inflationary experience during the period under review. Since Nyong's study was carried out from 1980 -1996, there is therefore the need to revisit the type of relationship that exists between demand for money and inflation in Nigeria.

Anoruo (2002) examined the stability of the M2 money demand function in Nigeria during the Structural Adjustment Programme (SAP) period. He adopted Johansen and Juselius co-integration procedure to examine the existence of long run relationship between real discount rate economic activity and real M2. He discovered the existence of a stable relationship between them

Based on the above review, some of the authors have been able to do justice to the empirical questions. Despite this, there is still need to complement these existing works. This will be done by investigating the effect of inflation on demand for money in Nigeria using a more recent data. This paper will also complement the existing literature by adopting the ordinary least square method to examine the effect of demand for money and inflation on economic growth

## **3.0 METHODOLOGY**

### **3.1 Sources of Data.**

This study utilized secondary data. The data were sourced majorly from the publications of the Central Bank of Nigeria (CBN). This includes Statistical bulletins, Economic and Financial Review, Monthly reports, annual report and statement of account for various years. Also, the International Financial Statistics and World Bank publications were also used. The quarterly data for G.D.P were supplied from CBN data files. The data used in

the model covered the period running from 1970 to 2003

The study was based on Nigeria's Demand for Money and Inflation and it covered a period of thirty-three years (1970-2003). This period was selected for study because a lot of developments had taken place in the Nigerian economy within this period. For instance, the recent oil price hike would have had effect on the general price level, which is expected to exert some influence on demand for money. Besides, the period spanned both pre-SAP and post-SAP period. Analyses were done, putting into consideration the SAP periods. In recent times, there are sophisticated methods of analysis in use for instance, the Error Correction Model (ECM). It seems as if the use of the ordinary least square approach is almost going into extinction. This calls for a re-examination of the demand for money using the ordinary least square method. This was to test whether there was a wide range of differences between the result that would be obtained and those of other studies.

### 3.2 Model Specification.

Following Akinlo and Folorunso (1999), the model adopted in this study is stated in its functional form below:

$$M^d = f(Y, R^d, R^f, \pi, P, E) \quad \text{_____ (1)}$$

Where:

$M^d$  = Demand for money

$Y$  = Income

$R^d$  = Domestic interest rate

$R^f$  = Foreign interest rate

$\pi$  = Inflation rate

$P$  = Price level

$E$  = Exchange rate.

The adapted form of the Cobb-Douglas production function was also used for this study. It is stated in mathematical form as follows (Habibullah, 1995):

$$M^d = \alpha_0 Y_t^{\alpha_1} R_d^{\alpha_2} R_f^{\alpha_3} \pi_t^{\alpha_4} P_t^{\alpha_5} E_t^{\alpha_6} \quad \text{_____ (2)}$$

Where;

$M^d$  = the nominal demand for money.

$\alpha_i$  = elasticities. (Where  $i=1, 2, 3, 4, 5, 6$ )

Other notations are as earlier defined.

The Cobb-Douglas production function was adopted for the following reasons: Economists have extended production function to more than two variables. It is very possible for the production function to accommodate more than two variables. Besides, the Cobb-Douglas production function allows for substitutability of factors. Also, the Cobb-Douglas production function relates only to constant returns to scale. The production function is linear homogenous of degree 1 which shows constant returns to scale. A unit elastic relationship exists between demand for money and some of the variables. Finally, the Cobb-Douglas production function is related to elasticity equals to unity i.e.

$$\alpha_0 + \alpha_1 + \alpha_2 + \alpha_3 + \alpha_4 + \alpha_5 + \alpha_6 = 1$$

The equation below is a broad specification of the model that considers both measures of the opportunity cost variables and the scale variables.

It takes the form:

$$\ln M^d = z_t + \beta_1 \ln I_t + \beta_2 \ln Q_t + e_t \quad \text{_____ (3)}$$

Where:

$Z_t$  = Intercept (=  $\alpha_0$  in equation (2))

$Q_t$  = Scale variables ( $Y, \pi, P, E$ )

$I_t$  = opportunity cost variables ( $R^d, R^f$ )

$e_t$  = error term

The range of variables whose effect would be tested includes both the scale and the opportunity cost of holding money variables. However, those variables included in the estimated equation above are dictated by the objectives of the study and more importantly the availability of data on an annual basis. Specifically, the effect



of some measure of income or wealth ( $Y$ ); domestic interest rate on interest bearing asset ( $R^d$ ); Foreign interest rate paid on interest bearing asset ( $R^f$ ); General price level ( $P$ ); Inflation rate ( $\pi$ ) and exchange rate ( $E^r$ ) on demand for money ( $M^d$ ) shall be tested. In view of this, the actual nominal equation specified for estimation (including error term) is as follows (the variables are in logarithmic form):

$$M_d^* = \alpha_0 + \alpha_1 Y_t + \alpha_2 R_t^d + \alpha_3 R_t^f + \alpha_4 P_t + \alpha_5 \pi_t + \alpha_6 E_t^r + e_t \quad (4)$$

where  $M_d^* =$  Nominal demand for money;  $e_t =$  error term

Other notations are as earlier defined.

The general consensus however is that demand for money to all intents and purposes is the demand for real balances. Therefore the equation to be estimated in real terms (where all variables are in logarithmic form) is:

$$m_d^* = \alpha_0 + \alpha_1 y_t + \alpha_2 r_t^d + \alpha_3 r_t^f + \alpha_4 p_t + \alpha_5 \pi_t + \alpha_6 e_t^r + e_t$$

where  $m_d^* = \text{real demand for money} \left( \frac{M_d^*}{P} \right)$

$e_t = \text{error term}$

(5)

In an attempt to capture the effect of the demand for money and inflation on economic growth, another model was formulated. The adapted form of Solow's model is used, stated as follows.

$$\Delta y = \beta y_{t-1} + \sigma \left( \frac{inv}{GDP} \right) + \alpha (M_2) + \delta (Inf) + e_t$$

(General model for Demand for Money, Inflation and growth)

$$\Delta y = \beta y_{t-1} + \sigma \left( \frac{inv}{GDP} \right) + \alpha (M_2) + e_t$$

(Demand for money and Growth)

$$\Delta y = \beta y_{t-1} + \sigma \left( \frac{inv}{GDP} \right) + \delta (Inf) + e_t$$

(Inflation and Growth)

where

$y_{t-1}$  = Lagged GDP (GDP last year)

$M_2$  = Broad demand for money

inf = inflation rate

inv = investment rate =  $\frac{inv}{GDP}$

GDP = Gross Domestic product

$\Delta y$  = Economic growth

$\beta, \sigma, \alpha, \delta$  = Elasticities

$e_t$  = Error term

### 3.3 Definitions and measurement of variables

**Demand for Money:** Demand for money uses money supply as its proxy. This is based on classical assumptions that demand for money must be equal to the money supply in equilibrium in the economy (Jhingan, 1997). The broader definition of money supply  $M_2$  was adopted for data analysis. This was because the theory that backed up this study made use of the broader definition of money supply to explain demand for money function. Though the focus of the study was on the broader definition of money supply  $M_2$ , the two of them  $M_1$  and  $M_2$  was examined in the process of analysing the data.  $M_1$  is the narrow definition of money supply. It is the sum of currency in circulation (currency outside banks) and demand deposits at commercial banks and central banks.  $M_2$  is the broader definition of money supply.  $M_2$  is composed of  $M_1$  plus savings and time deposits with commercial banks plus total deposits, liabilities of merchant banks

**Interest Rate:** is a form of income accruing to its owner for the use of capital. Domestic interest rate  $R^d$  and foreign interest rate  $R^f$  are the opportunity cost variables that were examined in this study. The treasury bill rate (short term interest rate) was used as a proxy to represent the domestic interest rate  $R^d$ . The federal funds rate was used as a proxy for the foreign interest rate.

**Inflation** It is an increase in the rate at which people exchange money for goods or vice versa. The consumer price index is commonly used to measure inflation in Nigeria and was used in the study as well.

**Exchange Rate:** is the price at which one currency is exchanged for another currency for gold or special drawing rights. The exchange rate of the naira is defined in terms of the amount of naira that may be exchanged for one unit of the U.S Dollar.

**Economic Growth:** is defined as the steady process of increasing productive capacity of the economy and hence of increasing national income. Economic growth was measured using real GDP.

### 3.4 A-Priori Expectation

It is expected that a direct positive relationship exists between the demand for money  $M^d$  and income level (Y). The coefficient of Y is expected to carry a positive sign. Also, it is expected that an inverse negative relationship exists between demand for money  $M^d$  and the rate of interest (both domestic interest  $R^d$  and foreign interest rate  $R^f$ ). The coefficient of  $R^d$  and  $R^f$  are expected to carry negative signs. Furthermore, it is expected that a direct positive relationship exists between the demand for money  $M^d$  and inflation rate  $\pi$ . The coefficient of inflation rate  $\pi$  is expected to carry a positive sign. Besides, it is expected that a direct positive relationship exists between demand for money  $M^d$  and the exchange rate  $E^f$ . The coefficient of exchange rate  $E^f$  is expected to carry a positive sign. Finally, it is expected that a direct positive relationship exists between demand for money  $M^d$  and the level of the prices (P). The coefficient of price level P is expected to carry a positive sign.

### 3.5 Method of Analysis and Estimation Technique

Ordinary least square method (OLS) was adopted for the purpose of analysing data. OLS is one of the commonly employed methods in estimating relationships in econometric models. The parameter estimate obtained by ordinary least square have some optimal properties like the best linear unbiased estimates (BLUE) (Koutsoyiannis, 1977). The multiple regression method was used in analysing data. This was because the variables that were examined could only be accommodated by this method

## 4.0 ANALYSIS AND INTERPRETATION OF DATA

### 4.1 Time trend analysis

The inflation figures were subjected to time trend analysis using an ordinary least square regression analysis stated as follows:

$$\text{inf} = \alpha_o + \alpha_1 t + e_t$$

Where; inf = inflation rate

$\alpha_o$  = intercept

$\alpha_1$  = elasticity

t = trend

$e_t$  = error term

Re-stated in its linearized form, it becomes as:

$$\ln \text{inf} = \ln \alpha_o + \ln \alpha_1 t$$

Results of inflation trend analyses are captured in the table 1

Table 1: Summary Table of Inflation Trend Equation

Period	Trend Equation	Model statistics	Significance of Trend
1970 – 2003	$\text{Lin}f = 2.52 + 0.01t$	$R^2 = 0.0256451$ F-value = 0.8422 DW = 1.15	t-value = 0.918* $p > 0.05$
Pre-SAP 1970 – 1985	$\text{Lin}f = 2.36 + 0.03t$	$R^2 = 0.0353307$ F-value = 0.5127 DW = 1.81	t-value = 0.716* $p > 0.05$
Post-SAP 1986 – 2003	$\text{Lin}f = 3.46 - 0.02t$	$R^2 = 0.019983$ F-value = 0.3262 DW = 0.873	t-value = -0.571* $p > 0.05$

Source: Author's Computation

$R^2$  is the coefficient of determination showing goodness of fit, DW is the Durbin Watson statistics, and F-value shows the overall significance of the parameter. From the analysis, inflation was found not to be statistically significant. Inflation was not affected by trend. Inflation in the country was caused by the policies which the government lays down and not by trend.

Even though analysis was carried out for both M1 and M2, we considered it fit to run an analysis for M2. This is because M2 allows variables to be examined for long term periods (Jhingan, 1997). As a result of this, we considered it quite expedient to run a separate analysis for M2, dividing the study period into pre-SAP period and post-SAP periods. Moreover, where long range planning is required, M1 will not be able to fit appropriately into this role. The long term period is what is actually required to make necessary forecast that will be needed for policy decisions.

#### 4.2 Economic 'A priori' Criteria

Here we examine the sign and the size of the coefficients of economic relationships. They are determined by the principles of economic theory.

The result of model 1 (real M1) in table 2 (please see appendix) indicated that the coefficients signs of foreign interest rate and inflation rate were found to support theoretical expectation. This was however different from what the coefficients signs of the domestic interest rate and exchange rate revealed. The result of model 2 (real M2) in table 2 showed that it was only income and foreign interest rate that were consistent with economic theory. The domestic interest rate, inflation rate and the exchange rate were found to be inconsistent with economic theory. For instance, a positive sign on domestic interest rate in both models was surprising. An increase in demand for money should be accompanied by a fall in the domestic interest rate and vice versa in line with the monetarist view. Also, inflation rate in model 2 that was expected to have a positive sign deviated from what economic theory suggested. An increase in demand for money should be followed by an increase in the rate of inflation as the monetarists believed. But from the findings, it appeared that the monetary authorities are contended with a negative relationship between demand for money and inflation rate. This looked reasonable especially if inflation is continually kept under control.

Finally, the negative relationship that was found between demand for money and exchange rate implies that the monetary authorities have reduced the exchange rate of the naira with respect to the U.S dollar. However, real M2 model was re-estimated by dividing the study period into two. The pre -SAP period (1970 – 1985) and the post -SAP period (1986 – 2003) under the pre -SAP, the result of the model 3, showed that the coefficients of income and foreign interest rate had the expected signs with the exceptions of the domestic interest rate, inflation rate and the exchange rate which were found to be inconsistent with economic theory. These findings were however different from what were obtained during the post -SAP era (model 4). The



opportunity cost variables and a scale variable (exchange rate) carried the correct signs but the remaining scale variables (income and inflation rate) had the wrong signs. It is quite pertinent to note that in all the models that were estimated, the coefficient of the foreign interest rate have been carrying the expected negative sign. Moreover, their magnitude seemed to be economically sensible. Income was also discovered to be consistent to some extent with the exception of the post-SAP period when it deviated from the expected positive sign. Apart from these two, the remaining variables have been carrying varying signs.

### 4.3 Statistical Criteria.

They refer to the first order test. Statistical criteria are secondary only to the a priori theoretical criteria. The statistical criteria focus on the t-values. It checks whether the variable are statistically significant at 5% level. In model 1, income took the positive sign as expected and it was significant with a value of 3.05. Though the foreign interest rate and the inflation rate had the expected negative and positive signs respectively, they were found not to be significant. The domestic interest rate and the exchange rate were found to be inconsistent with findings. Despite the inconsistency of the exchange rate, it was still significant at 5% level with the exception of the domestic interest rate that was not significant at all.

In model 2, income and foreign interest rate were found to be significant at 5% level with the expected signs. The remaining variables were both inconsistent and insignificant.

In model 3, during the pre -SAP years, it was only income and exchange rate that were significant at 5% level. Even though exchange rate had the wrong sign, it was still significant. Domestic interest rates were all insignificant at 5% level. Even though foreign interest rate was not significant it supported economic theory.

In model 4, during the post-SAP era, findings revealed that income, foreign interest rate and exchange rate were all significant at 5% level. Domestic interest rate and inflation rate were not significant at all.

Table 3: Summary of Statistical Criteria of Regression Results.

$\ln M_d = \ln \alpha_0 + \alpha_1 \ln Y_t + \alpha_2 \ln R_t^d + \alpha_3 \ln R_t^f + \alpha_4 \ln \pi_t + \alpha_5 \ln P_t + \alpha_5 \ln E_t$ (Nominal demand for money)					
$m^*_d = \alpha_0 + \alpha_1 y_t + \alpha_2 r_t^d + \alpha_3 r_t^f + \alpha_4 \pi_t + \alpha_5 e_t^r$ (Real demand for money in logarithmic form)					
variables:	y	r <sup>d</sup>	r <sup>f</sup>	$\pi$	e <sup>r</sup>
Expected Signs	(+)	(-)	(-)	(+)	(+)
Narrow Money (M <sub>1</sub> )	(+)	(+)	(-)	(+)	(-)
Significance at 5% level	S	NS	NS	NS	S
Broad Money (M <sub>2</sub> )	(+)	(+)	(-)	(-)	(-)
Significance at 5% level	S	NS	NS	NS	S
Broad Money (M <sub>2</sub> ) (Pre -SAP)	(+)	(+)	(-)	(-)	(-)
Significance at 5% level	S	NS	NS	NS	S
Broad Money (M <sub>2</sub> ) (Post -SAP)	(-)	(-)	(-)	(-)	(+)
Significance at 5% level	S	NS	S	NS	S

S- means the variable is significant at 5% level, NS- means the variable is not significant at all

Source: Author's Computation

### 4.4 Econometric Criteria.

Here, we focus on the R<sup>2</sup>, the F-statistics and the Durbin Watson test. In model 1, R<sup>2</sup> with a value of 0.344328 indicated that the coefficient of determination cannot be said to be of good fit as it explained at least 34% of changes in the dependent variable. The F-value was significant at 2.836. The Durbin Watson statistic was low. This suggested the possibility of serial correlation or auto correlation because the value 0.477 was far from 2. In model 2, R<sup>2</sup> was also low with a value of 0.329079 which was a bit lower than real M1 (0.344328). This implied that the coefficient of determination cannot be a good measure of fit as it explained 32% of the variation in the dependent variable. The F-value was also significant with a value of 2.649. Durbin Watson Statistic indicated some degree of auto correlation because the value was less than 2. It was even lower than that of real M1 at a value of 0.457. In model 3, during the pre-SAP period, real M2 had the highest coefficient of determination, R<sup>2</sup> with a value of 0.957371 which indicated that the coefficient of determination was a good fit as it explained roughly 96% of the variation in the dependent variables. The F-value was high at 44.92. Durbin Watson statistics with a value of 1.55 revealed some degree of auto correlation which was not as serious as the values obtained in model (1) and model (2) respectively. In model 4, during the post-SAP years, real M2 had a lower coefficient of determination relative to the value of the pre-SAP period. The R<sup>2</sup> value of 0.762339 was also high compared to

other value in model (1) and model (2). The value explained 76% of the changes in the dependent variables. The F-value was 7.698. Durbin Watson statistic value indicated the presence of autocorrelation.

The choice of best model was based on the model with the highest value of  $R^2$ . Considering this criterion, model 1 could be taken as the best where 34% of a change in real demand for money was explained by the changes in income, domestic interest rate, foreign interest rate, inflation rate, and exchange rate. But because model 1(M1) estimated real narrow demand for money in the short run period, it would not be appropriate to stick to it. Though model 1 (M1) performed better than model 2 (M2), M2 was seen as a better option because it fitted properly into long period planning which is necessary for this study. In model 3, however, M2 was re-estimated by dividing the study period into pre -SAP and post -SAP period. M2 in the pre -SAP explained almost 96% of a change in real demand for money explained by the changes in income, domestic interest rate, foreign interest rate, inflation rate and exchange rate. M2 in the post -SAP period explained 76% of a change in real demand for money explained by the variation in the independent variables. The choice of best model is M2 (post-SAP). This can be viewed from the aspect of the Durbin Watson test which revealed the absence of autocorrelation with a value of 2.39 which is greater than the 1.55 value of M2 pre-SAP period.

Generally, the model that was adopted in this study could be said to be reasonable based on the three criteria they were subjected to. The presence of auto correlation was discovered to be present in almost all the models except for one of them which had a value of 2.39 during M2 post-SAP period. The autocorrelation could be as a result of the method of estimation that was used for the analysis.

#### 4.5 Demand for Money and Growth

The models estimated for demand for money and growth revealed that demand for money was significant at 5% level even at absolute value during the post -SAP period. This was not with the exception of model 2 which was not significant at all. All the three models estimated were not consistent with theoretical expectation. Growth was found to be inelastic with respect to demand for money. Regression result for demand for money and economic growth is presented in the table:

**Table 4: Demand for Money and Economic Growth**

Table 1: Demand for Money and Economic Growth

Results from Demand for Money and Growth (1971 – 2003)				
$\Delta y = 0.788358 - 0.220448L_{inv} + 0.375440LM_2 - 0.493151LGDP_1$				
S.E	(0.03366)	(0.08580)	(0.09689)	
t-value	-6.55*	4.38*	-5.09*	
$R^2 = 0.606904$	DW = 1.56	Fvalue	$F(3,29) = 14.92(0.000)$	
Pre -SAP Period 1971 – 1985				
$\Delta y = 2.15287 - 0.240088L_{inv} + 0.603120LM_2 - 0.837549LGDP_1$				
S.E	(0.09735)	(0.3333)	(0.4248)	
t-value	-2.47*	1.81*	-1.97*	
$R^2 = 0.589155$	DW = 1.26	F-value	$F(3,11) = 5.258(0.017)$	
Post -SAP Period 1986 – 2003				
$\Delta y = 0.908361 - 0.189312L_{inv} + 0.416419LM_2 - 0.522726LGDP_1$				
S.E	(0.04325)	(0.1408)	(0.1345)	
t-value	-4.38*	-3.89*	2.96*	
$R^2 = 0.668313$	DW = 1.97	F-value	$F(3,14) = 9.403(0.001)$	
<i>The figures in the models above in parenthesis are the standard error</i>				
<i>The t-values are figures carrying asterisk</i>				

Source: Author's Computation

The Durbin Watson statistics of the three models indicated some level of auto correlation between the error terms, but they are not very serious. The estimated results could be described as being of good fit as the explanatory variable explains between 58 and 67% of the variation in the three equations that were estimated. The best model in the three equations was equation (3) this is because it had the highest value of  $R^2$  with a value of 0.668313. Evidence from the findings revealed that demand for money has a great impact on economic growth. This implies that if the economic growth of Nigeria is to be controlled appropriate attention should be given to the amount of money people hold. This is because if people demand for more money without commensurate productivity, it will be inflationary and when this occurs, it will undermine the real GDP (which is a measure of economic growth).

#### 5.0 CONCLUSION

The economic performance of the Nigerian economy revealed that for quite some time now, the GDP of the country has been declining and fluctuating over time as compared with the U.S economy that was growing even

in the face of inflation. This called for a critical evaluation of factors that can encourage increasing and stable growth even in the face of inflation backed with high rate of money demand. In an attempt to combat this problem, the study examined whether there was a relationship between demand for money and inflation and their effects on the growth pattern of the economy. Inflation had the wrong signs in most of the models except for model 1 that was consistent with the findings. Inflation rate over the years has not had any influence on demand for money or rather demand for money was insensitive to the inflation rate. This could also mean that inflation cannot be used to control the amount of money people hold.

Available evidence strongly revealed that inflation was not affected by trend but by policies of government. It is therefore recommended that the authorities of Nigeria should implement policies that will ensure minimal inflation rate. Also our findings indicated that inflation does not exert any significant influence on demand for money. Following this, attempt to control the amount of money people hold should not be done through inflation since it would not be effective. It should be done through the adoption of an appropriate income policy

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**Table 2: Demand for Money Function**

Results From Real Narrow Money Model (M <sub>1</sub> )					
1. M <sub>1</sub> = 1.47820 + 0.297329LGDP + 0.127899LTBR + 0.00337396LINF – 0.315089LNER – 0.0522350LFFR					
S.E	(0.09737)	(0.1751)	(0.08165)	(0.1432)	(0.1890)
t-value	3.05*	0.730*	0.0413*	-2.20*	-0.276*
R <sup>2</sup> = 0.344328	DW = 0.477	F-value	F(5,27) = 2.836(0.035)		
Results From Real Broad Money model(M <sub>2</sub> )					
2. M <sub>2</sub> = 2.16179 + 0.265418LGDP + 0.217024LTBR – 0.00694122LINF – 0.298954LNER – 0.0297485LFFR					
S.E	(0.09867)	(0.1775)	(0.08274)	(0.1451)	(0.1916)
t-value	2.69*	1.22*	-0.0839*	-2.06*	-0.155*
R <sup>2</sup> = 0.957371	DW = 0.457	F-value	F(5,27) = 2.649(0.045)		
Results from Real Broad money during the pre -SAP period 1970 – 1985 (M <sub>2</sub> )					
3. M <sub>2</sub> = -0.985049 + 0.597701LGDP + 0.00917352LTBR – 0.0128652LINF – 0.899291LNER – 0.0942652LFFR					
S.E	(0.05997)	(0.1734)	(0.05306)	(0.4434)	(0.1672)
t-value	9.97*	0.0529*	-0.242*	-2.03*	-0.564*
R <sup>2</sup> = 0.957371	DW = 1.55	F-value	F(5,10) = 44.92(0.000)		
Results from Real Broad Money model during the post -SAP period (1986 – 2002) M <sub>2</sub>					
4. M <sub>2</sub> = 10.0550 – 0.318997LGDP – 0.218933LTBR – 0.0536289LINF + 0.325091LINER – 0.326113LFFR					
S.E	(0.06820)	(0.1644)	(0.04500)	(0.08785)	(0.09870)
t-value	-4.68*	-1.33*	-1.19*	3.70*	-3.30*
R <sup>2</sup> = 0.762339	DW = 2.39	F-value	F(5,12) = 7.698 (0.002)		

From the models above,

*The figures in parenthesis are the standard error.*

*The t-values are figures carrying asterisk*

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